(No Model.)

2 Sheets—Sheet 1

H. C. GOULDING.

LOCOMOTIVE.

No. 422,075. Patented Feb. 25, 1890.

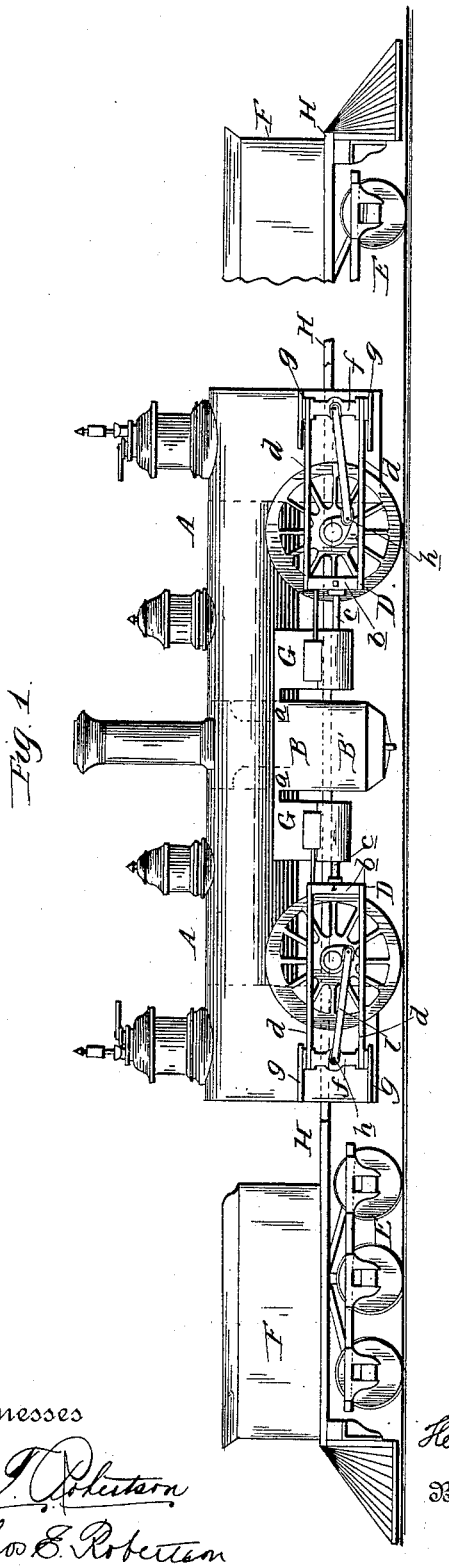

Fig. 1.

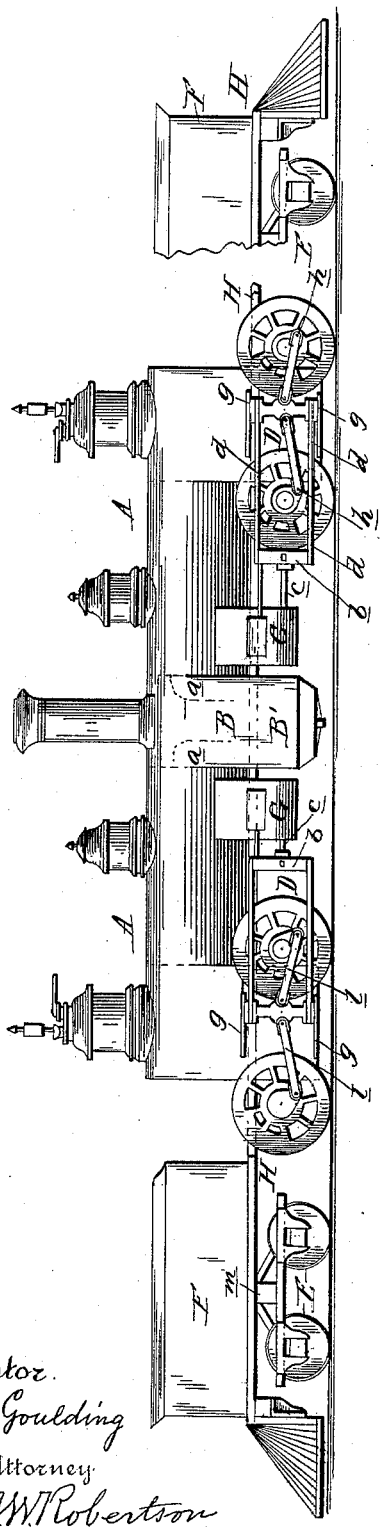

Fig. 2.

Witnesses

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Thos. E. Robertson

Inventor.

Henry C. Goulding

By his Attorney

T. J. W. Robertson

(No Model.) 2 Sheets—Sheet 2.

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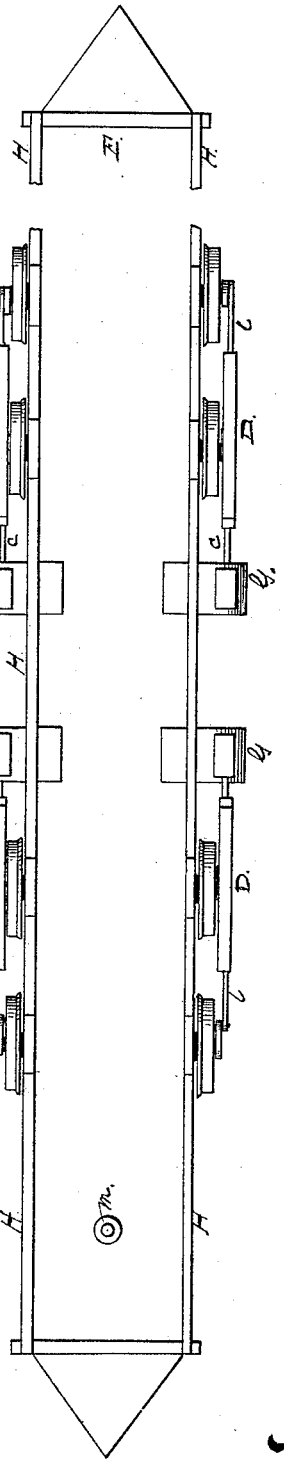

Fig. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY C. GOULDING, OF NASHOBA, MASSACHUSETTS.

LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 422,075, dated February 25, 1890.

Application filed April 10, 1888. Serial No. 270,227. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. GOULDING, of Nashoba, county of Middlesex, and State of Massachusetts, have invented certain new and useful Improvements in Locomotives, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object of this invention is to construct a powerful locomotive capable of high speed and great traction-power, without in the case of passenger-engines coupling pairs of driving-wheels together, and in the case of freight-engines by coupling only two pairs of driving-wheels together in two sets or groups; and the locomotive is so constructed that there shall be no excessive weight on either the driving or the truck wheels, and it is especially adapted for turning curves easily without shock to the engine or great strain upon the rails. The usual wheel-connecting rods are absent from this form of construction, and consequently the weight, cost, risk of breakage, and loss of power are greatly reduced, and the invention embraces other points of novelty, all of which will be hereinafter fully set forth.

The objects of the invention are attained by setting two boilers, with their smoke-box ends together, centrally on a continuous frame, which supports also a tank or tender at each end, thereby making the locomotive a double-ender; by having a common smoke-stack for both boilers central between them; by placing four cylinders in such position as to admit of their exhausting into the common smoke-stack; by mounting the boilers for a passenger-engine on but four driving-wheels and for a heavier freight-engine on but four pairs of driving-wheels; by dispensing with parallel or side wheel connecting-rods and using instead a combination cross-head of peculiar construction, and by making the treads of the driving-wheels "blind" or without flanges and the tender-trucks swiveled and with flanged wheels for guiding the locomotive and holding it on the rails.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 represents a side elevation of my improved passenger-engine with parts removed to exhibit other parts. Fig. 2 represents a side elevation of my improved freight-engine with parts removed to exhibit other parts. Fig. 3 represents a plan of the engine-frame with some parts of the engine in position.

A A represent the two boilers set with their smoke-box ends together, with the smoke-box B between them, which latter has two depending deflecting-plates (indicated by dotted lines *a a*) to deflect the sparks and cinders down into the spark-arrester B′, which is in a more convenient position for catching the sparks and cinders and more easy to empty than is the present form of extended smoke-box.

By using but two pairs of driving-wheels on the passenger-engine I do away with wheel-connecting rods, reduce the weight and cost of the locomotive, and avoid the risks to life and engine incurred by the breaking of such rods, which not unfrequently occurs when running at high speeds. I also avoid incurring the great loss of power which is inseparable from the coupling together of two or more pairs of driving-wheels, which have to be revolved synchronously however much they may vary in diameter, as they always do in a greater or less degree after short service.

The railway service demands more powerful locomotives for the fast-running passenger-trains and the heavy freight-trains, and the maximum weight within safe limits on driving-wheels has already been reached in the old construction. To put two heavy locomotives together to run a train involves the doubling of the engine-hands to do twice the work, while with my form of engine an addition of but one man to the force is required.

By constructing the locomotive with two boilers instead of one and with four cylinders instead of two I can secure greater power with smaller boilers and cylinders than usual, and can distribute their weight to much better advantage, and can construct them at comparatively less first cost, considering the power gained, and there may be a pair of cylinders G for each pair of drivers.

In the drawings may be seen my combina-

tion cross-head D, which consists of a bar or cross-piece *b*, secured centrally to the outer end of the piston-rod *c* and at right angles thereto, and from each end of this bar *b* a long rod *d* extends horizontally to a point beyond the driving-wheel and outside of the same, where they are secured to the opposite ends of a vertical guide-bar or cross-piece *f*, which is held and guided in guides *g*. The parallel rods *d* are sufficiently far apart to permit the crank-pin *h* to make its circuit without interfering with either of them, and the connecting-rod *l* from the crank-pin *h* takes hold of the cross-head at the end farthest from the cylinder G, as shown.

On passenger-engines, as shown in Fig. 1, wherein the wheels are in single uncoupled pairs, a pair being placed in front of each fire-box to receive sufficient weight for proper adhesion to the rails, the rods *l* are longer than those on freight-engines, as shown in Fig. 2, yet are much shorter and lighter than connecting-rods of the usual construction.

On freight-engines, whereon four pairs of wheels are used, two short connecting-rods *l* are applied from each cross-head to the crank-pins, as shown in Fig. 2, one of said rods *l* being extended forward from each cross-head and the other rearward to drive two pairs of wheels together. In this case when one rod *l* of a pair is pushing on a crank-pin and lifting on a guide-bar the other rod is pulling on the opposite crank-pin and operating to pull down on a guide-bar, thereby equalizing the strain thereon. This form of construction enables one to use short crank-pins, as only one rod is ever put on the same pin, and all the power is applied close to the face of the driving-wheel. In this form of construction there is also much less weight of metal in the connecting-rods than in any other form—less weight to be in vibratory or rapid rotary motion when the engine is running. The driving-wheels, having no flanges, will not in service force the rails apart no matter how far from each other each pair may be, and therefore the usual loss of power by the friction of the driving-wheel flanges against the rails on curves will be avoided.

The guiding of the locomotive is accomplished by the strong trucks E of the tenders F, which trucks are swiveled, as indicated at *m*, and have flanged wheels.

A tender F, containing a water-tank, is set at each end of the engine and supported by the continuous frame H, which also carries the boilers and cylinders, so that in case of collision, whichever end of the engine may collide, the parts damaged by the collision will be those of least cost and most easy of repair, and the tank, being broken, would distribute sufficient cold water over the wreck to extinguish any fire that might break out.

Being double-ended, and therefore adapted to run as well with one end forward as the other, this locomotive need never be turned around or be sent into the round-house except for repairs, and all parts of it requiring protection are designed to be inclosed by cabs.

A freight-engine is constructed on this plan by putting a pair of driving-wheels back of each fire-box as well as in front thereof, as shown in Fig. 2, and by coupling each pair to a cross-head by a separate rod, and thus a combination is formed which, in the matters of securing adhesion and power, has all the advantages of the so-called "consolidated" engines without the loss of power caused by coupling four pairs of drivers together, whereby all of them are compelled to revolve in the same time, however much they may vary in diameter. By coupling the wheels together in sets of only two pairs the loss of power referred to is decreased one-half. The rods *l* are short, compact, and strong, and of few parts, of the same lengths and interchangeable, and can be made with solid ends with bushing in each end. The cross-head pin can be taken out, rod inserted, and pin replaced, nut or collar be taken off, and crank-pin and rod slipped on same, all without straps, bolts, nuts, gibs, or keys.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A double-ended railway-locomotive constructed with two boilers set with smoke-box ends together, a smoke-box central between the boilers and common to both, a spark-arrester beneath the smoke-box, four engine-cylinders, combination cross-heads attached to the piston-rods and extending beyond and outside of the driving-wheels, connecting-rods extending from the crank-pins to those ends of the cross-heads farthest from the cylinders, and a tank or tender on swiveled truck in front of each boiler, all fixed on one continuous frame, substantially as herein shown and described.

2. A double-ended railway-locomotive provided with a water-tank at each end detached from the boilers and supported on swiveled trucks having flanged wheels and secured on the continuous boiler-supporting frame, which projects beyond the boilers sufficiently for that purpose, substantially as and for the purposes set forth.

3. In a double-ended locomotive provided with a tank or tender at each end, all fixed in a continuous frame, substantially as herein shown and described, driving-wheels having blind or unflanged treads and swiveled tank-trucks having flanged wheels, as and for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand, in the presence of two witnesses, this 31st day of March, 1888.

HENRY C. GOULDING.

Witnesses:
JAS. J. MCCARTY,
JOHN P. GUILD.